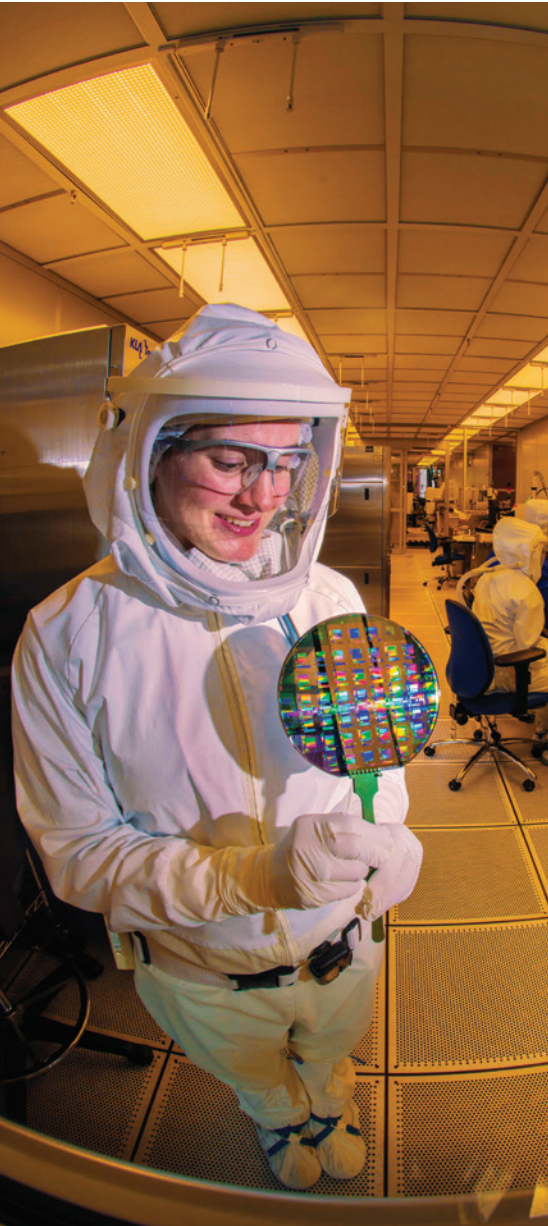




MESA fabs get an upgrade

New and modified equipment to sustain production for nuclear stockpile over coming decades



OUT WITH THE OLD — A microelectronics technician at Sandia studies a wafer, a thin slice of semiconductor material used in integrated circuits. **Photo by Randy Montoya**

By **Troy Rummler**

Sandia has completed phase one of an anticipated three-year upgrade at its plant responsible for making integrated circuits, similar to computer chips. The facility is now fully compatible with industry-standard, 8-inch silicon wafers — thin, round starting materials used for making chips. Previously, Sandia used 6-inch wafers.

Supporting the new size will help sustain production of microsystems for national security applications through 2040. Prototyping and product development activities have already resumed.

“Moving to 8-inch wafers aligns us with industry, which means we have a more sustainable supply of starting materials, tools and service,” said Sandia senior manager Mike Holmes, who is overseeing the process.

Larger wafers are generally more cost-effective than smaller ones because more devices can be made per wafer, Mike said. That’s why they’ve been widely adopted in industry.

Sandia’s decision, however, was driven by its national security mission. Six years of planning ensured the conversion would not affect production of components needed for national defense. Chips produced at Sandia can be found in the nation’s nuclear stockpile.

Much of the site’s staff have taken on new roles to assist with the upgrade, enabling Sandia to cover 85% of expenses with the facility’s regular operating budget. The conversion has been underway since August 2018.

The fabrication plant is part of Sandia’s Microsystems Engineering, Science and Applications complex, which is world-renowned for producing high reliability components that last for decades. The MESA complex is a world leader in protecting integrated circuits from otherwise damaging radiation.

The complex is also home to a research and development lab that invented the world’s fastest digital X-ray camera and a microfabrication plant supporting production and research of compound semiconductor devices.

Upgrade modernizes production process

At MESA, the journey from a raw silicon wafer to a finished chip takes hundreds of steps. Many specialized pieces of equipment handle, treat, build on, cut and test manufactured components. Every machine that touches wafers had to be modified or replaced.

This included the implanter, an 8-foot-tall, 19-year-old cube in which electrically charged elements, or ions, are accelerated and embedded into the wafers to tune their chemical and electrical properties. Construction crews had to tear down a wall to get the machine out of the building. Then they had to raise the ceiling and reinforce the floor for its 10-foot-tall replacement.

Other upgraded systems include equipment that uses light to transfer geometric patterns from stencils to precisely plot the locations of circuits and chemical-mechanical polishing tools that smooth and flatten surfaces for multi-layer processing.

The tooling upgrade is the first of four steps toward the facility’s conversion. The remaining three steps review and requalify the production line to ensure products made using the new equipment are identical to ones produced by the old equipment.

“Re-establishing the process on 8-inch wafers is extremely challenging,” Mike said. “We have to tune hundreds of interrelated parameters to get the same end result as before, but with different equipment and at a larger scale.”

This process, called requalification, is expected to be finished in 2021.

Armoring satellites to survive, operate through attacks

Sandia launches campaign to develop autonomous satellite protection systems

By **Kristen Meub**

Satellites do a lot of things — they help people navigate from one place to another, they deliver television programming, they search for new stars and exo-planets and they enable the U.S. nuclear deterrence strategy. But until recently, one thing they haven’t done — or needed to do — is defend themselves.

Researchers at Sandia launched a seven-year mission campaign this month to develop the science, technology and architecture needed for autonomous satellite protection systems. The campaign, called STARCS (Science and Technology Advancing Resilience for Contested Space), will fund dozens of Laboratory Directed Research & Development projects that focus on three critical areas:

- Threat-defended hardware, which is technology that protects satellite processors, circuits and systems from attacks.
- Cognitive analytics, or software algorithms that can rapidly and independently detect, adapt to and defeat threats.
- Sensor protection that shields sensors from harm.

The intent of the campaign is for Sandia to take on a large national priority through its internal research and development investments, said Jeff Mercier, one of the campaign’s senior managers.

“Sandia has a long and successful history in

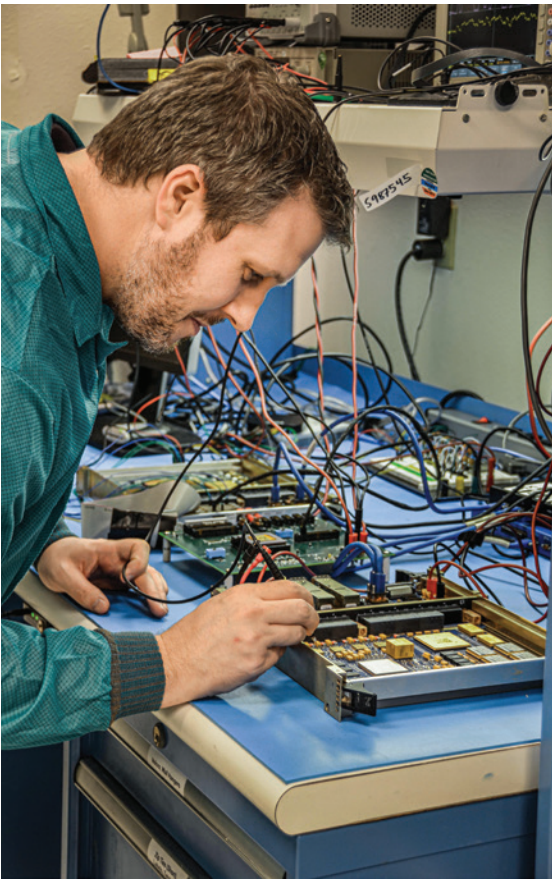
space systems engineering. We helped develop Vela in the 1960s and have continued to regularly deliver satellite payloads since then,” he said. “We need to ensure our payloads survive against emerging threats in space.”

Deterring a war in space

According to a recent report by the U.S. Defense Intelligence Agency, more countries and businesses are participating in satellite construction, space launch, space exploration and human spaceflight than ever before because both technical barriers and costs are falling, but at the same time, some foreign governments are developing capabilities to threaten others’ ability to use space.

“Space is important to our everyday lives, and space is also important to our national security,” said STARCS manager Drew Woodbury. “Historically, space has been benign, but now U.S. four-star generals are saying that they expect a space war within my lifetime. When I say space war, I mean satellites attacking satellites.”

A satellite could be threatened in numerous ways, from launching a missile to destroy it to shining a laser at its optical sensor to temporarily disable it, Drew said. Other threats include directed or kinetic energy, electronic warfare, robotic mechanisms, chemical sprayers, high-powered micro-waves, radiofrequency jammers and more.



CYBER DEFENSE — Drew Woodbury works on a “Flat-Sat” assembly designed to prove out software and cyber defense algorithms before deploying them to orbiting satellites. **Photo by Meagan Brace**

— CONTINUED ON PAGE 7



Sandia **My Way**
Open Enrollment **2020**

Open Enrollment begins Nov. 1 for active employees

Optimize Sandia’s benefits to fit your life during this year’s Open Enrollment for active employees beginning Friday, Nov. 1. Open Enrollment is your annual opportunity to review and update benefit elections, including medical, dental, vision and flexible spending accounts, and change dependent enrollments. Your 2020 Open Enrollment selections must be made by 5 p.m. MST, Thursday, Nov. 14.

To learn more, visit hr.sandia.gov or attend an Open Enrollment event, where active employees can learn about:

- \$25 virtual visits
- Vacation buy
- 401(k) plan
- Voluntary benefits like critical illness and accident insurance

Attend the event at your location for answers and expert advice from Sandia’s benefits team

2020 OPEN ENROLLMENT FAIRS

SANDIA/CALIFORNIA

Monday, Nov. 4
Noon-2 p.m.
Bldg. 904 auditorium
Employees and spouses

SANDIA/NEW MEXICO

Wednesday, Nov. 4
9 a.m.-2 p.m.
Steve Schiff Auditorium (Bldg. 825)
Employees only

and vendors. Questions to HR Customer Service at 505-844-4237.

Benefits changes

The changes listed below are effective Jan. 1, 2020:

- Sandia Total Health plan premiums will increase between \$1 and \$11 per month, depending on health plan and tier level. Dental and Vision premiums are not changing.
- A quarterly administrative fee of \$9.75 will be charged to 401(k) accounts with a balance greater than \$5,000. Also a 401(k) fee will be changed for participants who withdraw funds while they are still working for NTESS and when 401(k) accounts are subject to a court ordered distribution.
- Dental Plan now includes Preventive Care Security: diagnostic and preventive services do not count towards the Annual Maximum Benefit amount when provided by in-network providers.
- Medical benefits for gender dysphoria will be enhanced to include reassignment surgery.
- The maximum annual amount you may contribute to your Healthcare Flexible Spending Account will increase to \$2,700, per IRS regulations.
- For California, the maximum monthly amount you may contribute to your Transportation/Parking FSA will increase to \$265 for transportation and \$265 for parking.

Find details about these benefits and more in the Open Enrollment newsletter at hr.sandia.gov.

Voluntary benefits

Open Enrollment is your chance to select the voluntary benefits most important to you, including Sandia Extras like critical illness and accident

insurance and prepaid legal insurance, available only during Open Enrollment.

These Sandia Extras voluntary benefits are open to non-represented and MTC- and OPEIU-represented employees, and may be obtained without providing health information; however, benefit payments are not made for conditions that occurred prior to the coverage effective date.


Other voluntary benefits available during Open Enrollment include:

- Vacation buy
- Supplemental life insurance
- Long-term disability buy-up
- 401(k) automatic increase and rebalancing
- Flexible spending accounts for dependent care, healthcare and transportation (CA-only)

For more information about the voluntary benefits available, visit hr.sandia.gov and read the Open Enrollment newsletter.

Reminder

Employees can elect to receive an electronic copy of their 2019 1095-C form, which provides proof of health insurance coverage, in lieu of a paper form. Visit HR Self Service by Dec. 22 to request an electronic copy. This convenient e-form option ensures the forms are available as soon as you need them. If you haven’t already, consider signing up for an electronic W-2 form, as well.

All employees should receive a 1095-C form by Jan. 31, 2020, either electronically or through the mail. The form should be kept as supplemental documentation for your 2019 taxes. 

Need help signing up for electronic forms in HR Self Service? Contact HR Customer Service at 505-844-4237

Managed by NTESS LLC for the National Nuclear Security Administration

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2020 Open Enrollment for retirees

Open Enrollment dates:

Pre-Medicare: Tuesday, Oct. 15, through Friday, Nov. 15

Medicare: Tuesday, Oct. 15, through Saturday, Dec. 7

Changes for Pre-Medicare and Medicare retirees

The changes listed below are effective Jan. 1, 2020:

Pre-Medicare:

- Pre-Medicare premiums will increase.

Medicare:

- Your Spending Arrangement allowance will increase.
- For pre-2012 Medicare retirees, premiums for Sandia-sponsored Medicare plans will change.

Details about the Sandia retiree plans and Via Benefits can be found in the 2020 Pre-Medicare and Medicare Benefit Choices and Open Enrollment guides, available online at:

Pre-Medicare and group plans:
sandia retireebenefits.com

Medicare:
My.ViaBenefits.com/Sandia

2020 OPEN ENROLLMENT FAIRS		
WED., OCT. 30	UNM Continuing Education 1634 University Blvd. NE	
	Pre-2012 Retirees	Post-2012 Retirees
	9-11:30 a.m. Presentations Pre-Medicare, 9:30-10 a.m. Medicare, 10:10-11:15 a.m.	1:30-3:30 p.m. Presentations Pre-Medicare, 2-2:30 p.m. Medicare, 2:40-3:15 p.m.
MON., NOV. 4	Sandia Livermore campus Bldg. 904 auditorium	
	Pre- and Post-2012 Retirees Individual consultations with Via Benefits and carriers 9-11 a.m.	
THURS., NOV. 7	UNM Continuing Education 1634 University Blvd. NE	
	Pre-2012 Retirees	Post-2012 Retirees
	1:30-3:30 p.m. Presentations Pre-Medicare, 2-2:30 p.m. Medicare, 2:40-3:30 p.m.	9-11:30 a.m. Presentations Pre-Medicare, 9:30-10 a.m. Medicare, 10:10-11:15 a.m.

Lowering the bar for hydrogen-powered technology

Sandia co-leads multilab consortium to advance materials for hydrogen storage

By **Melissae Fellet**

Hydrogen as a carbon-free energy source could expand into a variety of sectors, including industrial processes, building heat and transportation. Currently, it powers a growing fleet of zero-emission vehicles, including trains in Germany, buses in South Korea, cars in California and forklifts worldwide. These vehicles use a fuel cell to combine hydrogen and oxygen gases, producing electricity that powers a motor. Water vapor is their only emission.

For hydrogen to continue to grow and change sectors across the economy, new infrastructure is needed. Hydrogen-powered cars store hydrogen gas onboard at a pressure 700 times greater than atmospheric pressure to drive as far as conventional gasoline vehicles. While this technology has enabled these cars to be commercialized, it cannot meet the challenging energy density targets set forth by DOE.

With the support of DOE’s Energy Efficiency and Renewable Energy Office’s Fuel Cell Technologies Office, the Hydrogen Materials Advanced Research Consortium, or HyMARC, a multilab collaboration co-led by Sandia, is developing two types of hydrogen storage materials to meet those federal targets. In the first phase of its work, the group identified strategies and did foundational research to increase the storage capacity of metal-organic frameworks and increase the storage efficiency of metal hydrides.

Now, the newly expanded collaboration is using the most promising strategies to optimize the materials for future use in vehicles, potentially offering more compact onboard storage systems, reduced operating pressures and significant cost savings.

“Those benefits could help get more fuel cell vehicles on the road by enabling a driving experience similar to that of conventional vehicles,” said Mark Allendorf, a Sandia researcher and co-director of HyMARC.

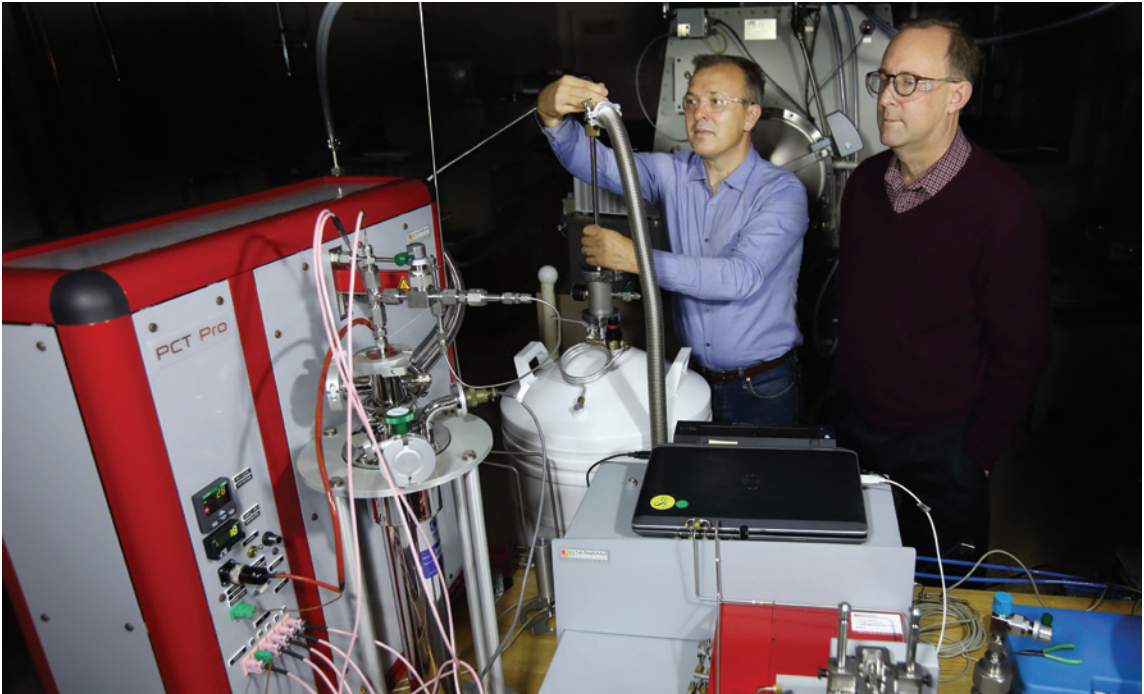
The consortium is now exploring ways to strip hydrogen reversibly from molecules such as ethanol. These molecular hydrogen carriers would be easier to transport to fueling stations than hydrogen gas, increasing the efficiency of fuel delivery and reducing the cost of hydrogen-powered vehicles, as well as other applications. Breakthroughs in advanced hydrogen storage materials coming out of HyMARC will also support DOE’s H2@Scale initiative to enable affordable large scale hydrogen production, storage, transport and utilization across multiple sectors.

Consortium continues

Since 2015, researchers at Sandia, Lawrence Berkeley and Lawrence Livermore national laboratories have focused on two primary types of hydrogen storage materials to learn how their shape, structure and chemical composition affect their performance. The HyMARC consortium has added researchers at the National Renewable Energy Laboratory, Pacific Northwest National Laboratory, SLAC National Accelerator Laboratory and the National Institute of Standards and Technology.

The expanded group recently received a second round of funding from the DOE Energy Efficiency and Renewable Energy Office to address performance issues that prevent the most promising materials from reaching the federal targets for hydrogen storage. To do that, the researchers have identified the most relevant challenges that slow the pace of hydrogen storage material innovation. They then develop tools to tackle those challenges, including reliable ways to make the materials, new computer models to predict material properties that influence their storage performance, and novel measurement methods to accommodate some materials’ high reactivity with moisture and oxygen.

“HyMARC makes these tools available to other labs that apply them to specific materials,” Mark said. “We also collaborate with them to facilitate their research.”



HOLDING HYDROGEN — Sandia researchers Vitalie Stavila, left, and Mark Allendorf are part of a multilab consortium to advance storage materials for future hydrogen-powered transportation. **Photo by Dino Vournas**

Taming temperature

The first class of materials of interest to HyMARC is called sorbents. These materials have tiny pores that act like sponges to adsorb and hold hydrogen gas on their surfaces. These pores create a material with a high surface area, and thus storage space. One gram of material can have as much surface area as an entire football field.

That leads to an unexpected practical effect: porous materials can theoretically hold more hydrogen than a high-pressure fuel tank, said Sandia chemist Vitalie Stavila. Yet because hydrogen gas interacts weakly with the pore walls, much of that storage space goes unused. These materials work best at cryogenic temperatures too low for practical use.

The best performing sorbents are materials called metal-organic frameworks. In these materials, rigid linkers made from carbon atoms connect individual metal ions like the bars in a playground jungle gym. To increase the amount of hydrogen stored in the materials, the consortium recommends adding hydrogen-grabbing elements like boron or nitrogen into the carbon linkers that form the pore walls.

Team members also have developed MOFs in which more than one hydrogen molecule can stick to a metal ion in the framework. Along with increased storage capacity, these materials interact with hydrogen more strongly. Practically, this means the gas sticks to the pore walls at higher temperatures.

Nanostructures increase storage efficiency

The second class of promising hydrogen storage materials is metal hydrides, a material that Sandia researchers have been making for decades. In these materials, metal ions hold hydrogen with chemical bonds. Breaking these bonds allows hydrogen gas to be released for use in a fuel cell.

However, these materials form strong bonds with hydrogen, and energy is required to release stored gas. Reducing the size of hydride particles from macroscopic grains to nanoclusters more than ten thousand times smaller than the width of a human hair makes the material much more reactive, allowing it to release hydrogen at lower temperatures. Vitalie and his colleagues use porous materials such as MOFs or porous carbon as templates to control cluster size and prevent them from clumping together.

“We learned during the first phase of HyMARC that making nanostructured metal hydrides allows us to tune the strength of the bonds formed with hydrogen and change how quickly hydrogen attaches to and leaves the surface,” Vitalie said. “This means less energy is needed to release the gas.”

The researchers are testing the nanoscale hydrides for features, such as storage reversibility and usable storage capacity, that are important for future applications. “We are building confidence

that nanoscale hydrides can be practical storage materials,” Vitalie said.

The group also is using a computer science technique called machine learning to rapidly identify the physical properties of these storage materials that correlate to the performance necessary to reach the federal targets. Their approach allows them to understand how the computer identified its predictions. “We are generating scientific insight to create new intuition of how these materials behave,” Mark said.

“Identifying hydrogen storage materials that can meet all of the DOE targets is an essential step toward transitioning to a future hydrogen economy,” he said.

For hydrogen-powered vehicles, meeting those targets for storage materials means such vehicles could have driving ranges, refueling times and fuel costs similar to conventional vehicles.

“Although the technical challenges are great,” Mark said, “the HyMARC team is highly motivated by the importance of its role and by its recent discoveries that point the way to successful materials.”

“

70 Years of Sandia:

HOW DID WE GET HERE?

”

Wed., Oct. 30

2–3:30 p.m. MDT

Live Streamed from Steve Schiff Auditorium (networking + cookies afterwards)

Sandia historian **Rebecca Ulrich** shares the history of who we were to better understand who we are.

Engineering success through predicting failure

By **Melissae Fellet**

Since people started forging and working with metal, they’ve arguably been interested in how it breaks. But only since the 1950s have scientists and engineers had a mathematical framework for using laboratory measurements of material failure to predict a structure’s resistance to cracking.

“These tools work well for brittle materials such as glass, but often not for other materials,” said Sandia materials scientist Brad Boyce.

Researchers who know the existing theories still struggle with predicting fractures in materials with complex microstructures or components made with 3D printing. They also do not work well for ductile metals, such as some steels, that deform and stretch before they fracture.

Around the world, materials scientists and engineers are trying different ways to predict fractures in ductile metals, but it’s not clear which approach is most accurate. To compare the different methods, Sandia researchers have presented three voluntary challenges to their colleagues: Given the same basic information about the shape, composition and loading of a metal part, could they predict how it would eventually fracture?

An overview of the third Sandia Fracture Challenge was recently published in a special issue of the International Journal of Fracture dedicated to results from the challenge. Now the friendly competition has shifted into a collaborative community of researchers refining their techniques for engineering reliable structures made from a variety of materials.

Learning from the broad community

Typically, predictions like these involve repeated rounds of experimental measurements and calculations, so that the modeling is essentially calibrated to known fracture data. For these challenges, however, participants did not know the actual outcome until after the end of the competition.

The first challenge, held in summer 2012, attracted 13 teams of researchers from universities, national labs and companies to predict crack initiation and spreading in a common stainless steel alloy. They all received the same engineering drawing of the test piece, microscope images of the material’s microstructure, data about the material’s

fracture toughness and measurements of how much stress it accumulated when strained. Then each team applied its own method to predict a crack’s path under a given amount of force.

Meanwhile, groups of researchers at Sandia and at the University of Texas at Austin, who were not participating in the prediction competition, fractured the material in their labs. They loaded test pieces into machines and pulled on them until they tore in half. Cameras recorded the crack paths, while instruments measured the amount of force on the samples.

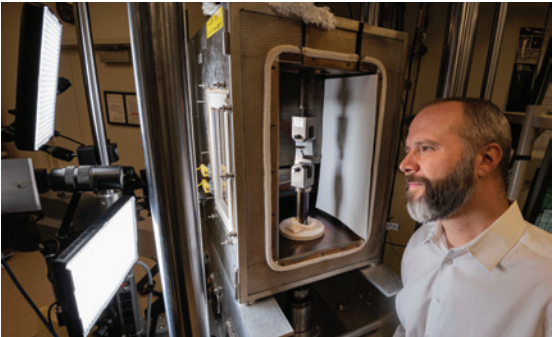
None of the 13 predictions completely matched all the experimental results, though many worked well for particular aspects of crack formation. With only one situation for comparison, it was hard to determine which prediction methods were most effective.

Two years later, the Sandia team issued a second challenge. This time 14 teams predicted the fracture pattern in a component made of a titanium alloy common in airplanes, spacecraft and medical devices. The teams were asked to predict crack formation from very slow loading as before, and also under rapid loading, such as that experienced in a car crash.

Rapid loading provides an interesting situation because quick force creates heat in the material and leaves little time for the heat to dissipate. In the second challenge, most teams did not combine thermal and mechanical modeling, Brad said. “But those that did tended to get the details right.”

The third challenge, held in 2016, asked researchers to predict cracks in stainless steel machined with a 3D printer. A 3D printer can make custom shapes that are impossible to create through traditional manufacturing methods, but the microstructure of printed metals can be more porous than forged metals in previous challenges. The researchers wondered if the internal porosity could make printed metals fracture sooner than expected.

For this challenge, 21 teams received extensive characterization data from tensile tests and detailed microstructural imaging. All teams predicted the crack initiation site and resulting path observed during experimental tests. The team with the best performance had participated in the previous challenges and learned from those prior experiences to improve their approach, Brad said.



PULLED APART — Materials scientist Brad Boyce, working with colleagues at Sandia, organized several challenges for researchers working to improve predictions for fractures in ductile metals. **Photo by Randy Montoya**

Now, the challenge participants continue as a community-owned collaboration, gathering to form the Structural Reliability Partnership. This group of scientists and engineers from universities, industry and national labs is working to improve models of fracture. The partnership includes 17 institutions, and partners share results with each other before publishing.

While the group can eventually tackle a wide variety of prediction challenges to engineer reliability, some of its initial interests include predicting physical properties of 3D printed metals and studying how hydrogen gas alters metal in hydrogen infrastructure. Predictions like these could help engineers better understand the reliability of shock-loaded springs or bolted joints, which are currently overdesigned to compensate for poorly understood fracture behavior.

The result means not only safer structures such as cars and airplanes, but also lighter vehicles that are more fuel efficient.

In the future, Brad said, the partnership’s efforts could expand to study plastics and ceramics, and zoom into fracture behavior at micro, nano and atomistic scales.

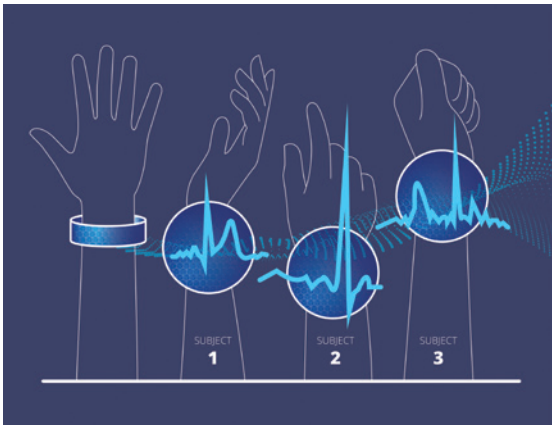
The fracture challenges also have inspired Brad’s own project, funded by Sandia’s Laboratory Directed Research & Development program. Advances in microscope technology mean materials scientists can see microstructural details of materials better than ever before. Brad is studying subtle details of microscopic voids in materials to better understand how a fracture begins inside a material before it is visible. [f](#)

Security in a heartbeat

By **Michael J. Baker**

A thumbprint to unlock a door. An eye scan to unlatch a vault. Both were once ideas of the future that may become things of the past if current research is successful.

Sandia is collaborating with a New Mexico small business to test and develop a biometric security system based on the human heartbeat. Sandia signed a Cooperative Research and Development Agreement with Albuquerque-based Aquila Inc. to develop and test a wearable prototype that can stream in real time an identifying



HEART ELECTRIC — Sandia and Albuquerque-based Aquila Inc. are joining forces to test biometric technology that uses unique electrocardiogram signals sent from a wearable device, possibly a wristband or chest strap, to identify a person for security purposes. **Illustration by Michael Vittitow**

signature based on the electrical activity of a person’s heart.

Sandia brings to the CRADA, signed in July, “the expertise in security systems and testing facilities that will allow us to emulate real-world characteristics to test access-control prototypes,” Sandia engineer Steven Horowitz said. “We have expertise in the types of specialized facilities this could be used in.”

In addition to sharing Sandia’s expertise in testing new technology, the CRADA has the added value of pairing a New Mexico small business with the national lab.

“Any opportunity Sandia has to work with a local small business such as Aquila not only has palpable economic impact, but brings a new perspective and energy to the core mission of the Labs,” Sandia CRADA specialist Jason Martinez said.

Aquila and Sandia will jointly assess the form the wearable may take, such as a wristband or chest strap. It would be an alternative to such things as fingerprints and eye scans when those access-control methods might be limited, such as in a laboratory where gloves or eye protection may be necessary.

Aquila’s wearable plans to use software developed by U.K.-based B-Secur that enables a heart rate and other wellness indicators to be streamed in real time.

“B-Secur’s HeartKey includes the ability to identify and authenticate an individual from their unique electrocardiogram signature,” said Steve Kadner, Aquila’s executive vice president. “The objective for the new system is to meet or exceed the current fingerprint or iris readers for access control and position tracking purposes, both operationally and economically.”

An electrocardiogram is a record of the heart’s electrical activity during a heartbeat. There are several different measurable features, which together produce an individual signature.

Physical security facilities test performance

The technology recognizes the wearer’s individual electrocardiogram signature and transmits a signal allowing the user access to a specific location, Steven said. The initial tests would be to see how the wearable communicates with access-control architecture, and additionally, whether it could effectively track a person’s movement within a facility.

Such function could be useful for Sandia and its national security mission, as well as other industries, including hospitals, according to those involved in the research. The CRADA’s content and direction were born from similar biometric security concepts Sandia has worked on and tested in the past, and from research Aquila has conducted. The new agreement aims to build on the previous research and take it to a higher technological readiness level.

“Sandia will draw upon its subject-matter expertise in access control to evaluate the performance of the system in scenarios similar to those in potentially applicable facilities,” Steven said. Sandia has particular expertise with systems where enhanced physical security and access control are necessary for domestic and international threat-reduction initiatives.

Under the terms of the CRADA, Sandia and Aquila expect to complete the development and testing of the prototype in a year. [f](#)

Sandia celebrates Hispanic Heritage Month

By **Valerie Alba**

In an annual tradition, Sandia commemorated National Hispanic Heritage Month with lively events to celebrate the cultures, histories and contributions of the Hispanic population.

Inspiration from a NASA astronaut

Sandia welcomed engineer and former NASA astronaut John “Danny” Olivas for a talk at the Steve Schiff Auditorium on Sept. 25. Olivas directs the Center for the Advancement of Space Safety and Mission Assurance Research at the University of Texas at El Paso, where he oversees space initiatives on the campus. He also consults with Sandia’s performance assurance department and performs forensic engineering for ES&H. His talk was sponsored by Hispanic Outreach for Leadership & Awareness and Inclusion, Diversity, EEO & AA.

For Olivas, watching the Apollo space missions on television, receiving a childhood gift of a telescope and taking a family vacation to Johnson Space Center ignited a passion for space exploration that, after decades of pursuit and perseverance, resulted in a doctorate in mechanical engineering and materials science and selection as a NASA astronaut. Olivas recounted his academic, professional and personal journey that led to him being the engineer the crew relied on to maintain mechanical systems onboard the STS-117 and STS-128 space shuttle missions.

Olivas shared a story about the importance of welcoming and applying diverse perspectives in everyday — and not so everyday — challenges. On his first space mission aboard the STS-117 in 2007, the engineers puzzled over how to repair one of the shuttle’s rocket engines, which had a damaged thermal protection system. During a brainstorming session, the shuttle’s physician suggested using a medical stapler to remedy a tear in the mesh. Olivas conducted a spacewalk to perform the repair, and it worked.

Olivas takes pride in sharing his story and inspiring the next generation through outreach, and he encourages others to do the same.

Olivas’ talk is available to employees on Sandia’s corporate streaming library and the HOLA and IDEA websites.

Before the presentation, attendees sampled food, drinks and desserts made by employees and voted in an art contest featuring STEM-themed drawings and paintings created by local K-12 students.

Food, dance and more on the field

On Oct. 3, HOLA hosted the annual Hispanic Heritage Month diversity event at Hardin Field. The celebration included Baila! Baila! and Ballet Folklórico dancers, music from Mariachi Tenampa, a samba sizzle Latin dance workout, food trucks, an employee art display and a car show.

Crystal Gutierrez, KRQE News 13 morning anchor, delivered the keynote address. Gutierrez



OUT OF THIS WORLD — Sandia’s Hispanic Heritage Month events kicked off with a presentation by former NASA astronaut John “Danny” Olivas. He discussed his personal and professional journey and the importance of dedication and hard work. **Photo by Bret Latter**



BAILA! BAILA! — Ballet Folklórico dancers took the stage at Hardin Field. **Photos by Lonnie Anderson**




also encouraged Hispanics to share their stories with others and reflected on the current and past contributions of the Hispanic population in the United States.

“We are shaping, we are molding and we are changing the story of America,” she said. “But it didn’t just start right now. We have been changing the story all along. I read in an article from USA Today that stated ‘the United States isn’t becoming a Hispanic nation; it always has been.’ That was written back in 2012. Seven years later, that statement is even more true today, isn’t it? But I ask you, who is telling your story and what story will you tell?”

For Roberta Rivera, HOLA deputy co-chair and community relations specialist, the event at Hardin was especially memorable. Her father, recording artist Roberto Griego, was among the performers.

Reflecting on the day, she said, “I’ve been involved in Hispanic initiatives for more than 20 years at Sandia, and today’s event truly represented the melding that is my work and personal life. It was a very proud moment to see my dad, who’s now in his early 70s, still singing and playing guitar and just sharing the music that folks have loved from him over the last 47-plus years of his career. I just love that I can thrive in my Hispanic culture at home and at work and that I’ve always had the support of my management to be fully engaged in Hispanic initiatives. Viva Sandia!”

Catalina Acosta, who organized both Sandia events, said, “As a member of the Hispanic community and a Sandian, having Hispanic Heritage Month events at the Labs means that I work for an organization that celebrates and recognizes contributions of Hispanic Americans and diverse cultures. I enjoy being part of the team that plans the event and sees it come together. We are a dedicated group, and we have fun using our creativity to create meaningful activities, from guest speakers to art displays. We’re dedicated to planning events that attract a diverse audience from across the Labs to attend at least one activity or event.” 



A FAMILIAR FACE — KRQE News 13 morning anchor Crystal Gutierrez delivered the keynote address, starting her remarks by thanking service members for their dedication and sacrifices, and thanking Sandia employees for their contributions to national security. **Photo by Lonnie Anderson**




MARIACHI TENAMPA — The popular local group performed for the crowd at Hardin. **Photo by Lonnie Anderson**



INSPIRED ARTWORK — Local K-12 students submitted STEM-themed drawings and paintings to the celebration’s annual art contest. The art was displayed during the Sept. 25 event. **Photo by Bret Latter**

Nonprofit organizations gather support at Sandia Giving Fair

By **Stephanie Holinka**
Photos by **Katrina Wagner**

Sandia’s 2019 Giving Fair featured 45 nonprofit organizations sponsored and supported by employees or the United Way of Central New Mexico Community Impact Fund. Attendees at the event, held in the Steve Schiff Auditorium courtyard, learned about the important work of local nonprofits that serve the community by fighting poverty and abuse and supporting the welfare of people and animals. The event was part of this year’s Sandia Gives campaign, which runs through Friday, Oct. 25. 



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Questions to Michelle Fleming at 505-844-4902.

Submit by one of the following methods:

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- FAX:** 505-844-0645
- MAIL:** MS1468 (Dept. 3651)

- INTERNAL WEB:** Click on the News Tab at the top of the Techweb homepage. At the top of the NewsCenter page, click the "**Submit a Classified Ad**" button and complete the form.

Due to space constraints, ads will be printed on a first-come, first-served basis.

MISCELLANEOUS

SCANDINAVIAN FESTIVAL, Nov. 2, 10 a.m.-4 p.m., Immanuel Presbyterian Church, 114 Carlisle SE, folk art, dancing, food, free. Richard-Franco, 505-294-5739.

“CIVIL WAR.” 3 volume set, by Shelby Foote, \$15; various other Civil War books, for interested. Colgan, 505-344-3776.

LOVESEAT, beige, \$250; dark dining table, w/4 chairs, \$450; modern dark brown velvet couch, 9-ft., \$500; modern glass table, \$100. Hartenberger, 505-264-9583.

DINING TABLE, 48-in. round, 4 chairs, wood top, ornamental metal base, \$225; buffet, 51-1/2”W x 17”D x 32”H, 4-drawer, 2 doors, \$150. Crespin, 505-610-1084.

COMPOUND MITER SAW, Hitachi C10 FCG, 15-amp, 10-in., rarely used, excellent condition, \$70 OBO. Haass, h3haass@gmail.com.

YOUNG AT HEART DICKENS VILLAGE, Nov. 8-9 & 15-16, concerts w/Bar-D Wranglers, 7 p.m. on Fri., 2 p.m. on Sat. Martin, 505-858-3009.

TWIN BED & DRESSER, \$350; Harvard multi-game foosball table, \$150; both items great condition. Garcia, 505-554-4765, ricgarc@yahoo.com, text/email for photos.

SECTIONAL COUCH/LOVESEAT, gray, Broyhill, 2 yrs. old, like new, \$600. Hiltz, 505-275-1758.

DAYBED W/DESK, folding, wall-mounted, full-size, currently mounted to wall, you remove, very good condition, \$400. Marrujo, 505-269-6812.

TRANSPORTATION

’16 FORD MUSTANG, coupe, new tires, clean interior, clean title, excellent condition, \$18,000 OBO. Chacon, 505-450-4321.

’01 HONDA ACCORD, \$500; ’15 Nissan Altima, 55K miles, \$3,300; both wrecked but running, project or parts cars, call for details. Lifke, 505-382-9448.

’11 BMW 135i, turbo, 300-hp, black int./ext., moon roof, navigation, clean, maintained, 70K miles, \$14,800 OBO. Wareing, 505-363-0243.

’14 F150 XLT, loaded, camper, towing, only 20K miles, \$25,000 OBO. Haddad, 505-859-1855.

’04 TOYOTA TUNDRA, crew cab, 4.7L V8, AT, 4x4, AC, PW, PL, PM, 154K miles, \$8,500 OBO. Fernandez, 505-280-6151, call or text.

RECREATION

’19 RIVERSIDE RETRO TRAVEL TRAILER, plus accessories, aqua/pewter, like brand new, never used, \$19,000. Ramos, 972-951-0290.

’13 GULFSTREAM INNSBRUCK 19BHC, 19-ft. RV, w/bunk beds, queen bed, shop stored when not in use, excellent condition. Tucker, 505-705-1390.

BICYCLE, ladies 26-in., new wheels, coaster brakes, basket, blue, excellent condition, photos available, \$85. Murphy, 505-892-0288.

ROAD BIKE, KHS, cantilever brakes, perfect condition, small to medium, photos available, \$250. Hanks, 505-249-1931, call or text.

REAL ESTATE

10 ACRES, Tijeras property, off Zuzax, north side of I40, Gutierrez Canyon, \$79,000. Romero, 505-263-6332.

3-BDR. HOME, 2 baths, 1,950 sq. ft., .25 acre, private backyard, new roof, carpet & deck oil, Wyoming/Comanche, 10 mins. to KAFB, MLS#949234, \$250,000. Blankenship, 505-681-0661.

WANTED

ROOMMATE, private bath, patio, beautiful views, great location, 140/Coors, \$575/mo. +1/2 utilities. Williamson, 505-321-4531.

GOOD HOME, loving cat, neutered male, current vaccinations, very sweet, w/outside shelter/bedding. Moore, 505-307-5237.

HOUSESHARE, Nov.-June, prefer male, furnished, beautiful NE Heights, perfect for new hire, visiting professor, grad student, \$1,000. Yourick, 505-259-8005.

ROOMMATE, share huge furnished 2-bdr., 15 mins. to Wyoming gate, close to shopping, ~\$700/mo. Bertino, joseph.bertino@gmail.com.

AD RULES

- Limit 18 words, including last name and home phone (web or email address counts as two or three words, depending on length).
- Include organization and full name with ad submission.
- Submit ad in writing. No phone-ins.
- Type or print ad legibly; use accepted abbreviations.
- One ad per issue.
- The same ad may not run more than twice.
- No “for rent” ads except for employees on temporary assignment.
- No commercial ads.
- For active Sandia members of the workforce and retired Sandians only.
- Housing listed for sale is available without regard to race, creed, color or national origin.
- Work wanted ads are limited to student-aged children of employees.
- We reserve the right not to publish any ad that may be considered offensive or in poor taste.

Mileposts



New Mexico photos by Michelle Fleming
California photos by Randy Wong



Thomas Grasser 30



Philip Kegelmeyer 30



Raivo Leeto 30



Dan Baca 35



Gordon Iben 35



Jef Duncan 30



Tom Weber 30



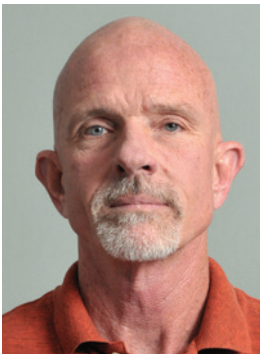
Timothy Berg 25



Cheryl Herrera 25



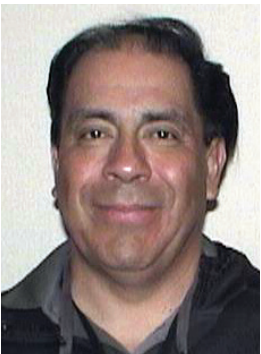
Bill Kitsos 25



Mark Reece 25



Divina Calderon 20



Ronald Espinoza 20



Jonathan Zimmerman 20



Steve Artho 15



Jose Castillo 15



Suzanne Chavez 15



Kelly Collins 15



Seanna Crouch 15



Carrie Devonshire 15



Liz Gallegos 15



Annette Gorman 15



Colin Hallahan 15



Jason Harper 15



Matthew Martin 15



James Rivera 15



Tony Statom 15

Armoring satellites

CONTINUED FROM PAGE 1

“Our overall goal is to provide innovative research and development that preserves unfettered access to space for the U.S.,” Jeff said. “The key to deterrence in space is having systems with the ability to operate through an attack and keep doing their jobs.”

Armor inspired by the human body

The three STARCS research areas — threat-defended hardware, cognitive analytics and sensor protection — will develop a satellite’s capability to automatically detect threats and defend itself to ensure that optical, radio frequency, reconnaissance and communications assets are preserved and operational during an attack. The campaign is also pursuing reversible threats — actions that temporarily disable an attacking satellite without destroying it.


“A satellite system is similar to the human body system,” Drew said. “Think of threat-defended hardware as the immune system encountering bacteria and viruses, while similarly, satellites have to withstand radiation, debris and other natural and man-made items in space,” he said. “We want the immune system of the satellite to respond to debris in a resilient way.”

Drew said the sensor protection research area is like shielding human eyes with sunglasses or safety goggles. An adversary could shine a laser at a sensor on a satellite to stop it from working as designed, much like shining a laser into a human eye would impair eyesight. This research area focuses on technology that could act like a pair of “glasses” that a satellite can wear when it detects a threat.

The technology for the cognitive-analytics focus, Drew said, is like the medulla oblongata in the human brain — home to the “fight or flight” response. The research will develop that same instinct for satellites so they can recognize attacks and deploy survivability mechanisms, he said.

Seeking academic partnerships, tech transfer

Sandia launched 12 STARCS-related LDRD projects this month, and Drew hopes to see even more projects per year for the rest of the campaign, which will run through 2027. About half of the projects launched this year include research partners from Sandia’s Academic Alliance schools, and the team is looking to partner with additional universities with relevant research focus areas.

“As the campaign continues, the ultimate result we are looking for is to develop more mature technology that can be transitioned to industry and the government,” Jeff said. 

How to work on STARCS

- A call for STARCS-related LDRD proposals will go out in late December.
- The team is especially interested in proposals in one of the three research areas that lend themselves to space-based experiments.
- Contact Drew Woodbury or Prabal Nandy for more information about STARCS and how to get involved.

Sandia health educator invited to speak at Virgin Pulse HERO forum

By **Lara Adams**

Work performed at Sandia is known for its excellence and innovation, and those achievements aren’t limited to our laboratories. In a nondescript portable building tucked between the Thunderbird Café and the Sandia Medical Clinic, a cross-functional team analyzes data and designs evidence-based programs to meet an important company objective — keeping employees healthy.

Impressed by Sandia’s collaborative, holistic and metrics-based approach to employee health, Virgin Pulse invited Sandia health educator and program coordinator Callie Lovato to speak at HEROForum19 in early September. A national non-profit, the Health Enhancement Research Organization has a mission to identify and share best practices in employee health and well-being. Callie’s talk centered on how Sandia uses collaboration and metrics to drive better health outcomes.

“I was able to show them our dashboards and scorecards that clearly illustrated ROI (return on investment) and VOI (value of investment),” Callie said. “We gather information from Benefits that helps us ensure we are addressing health concerns, and we track all employee engagements — classes, events, appointments, fitness walks — so we know what employees are interested in.”

“We collect way more metrics than (other employee health programs),” said Kim Pohl, Sandia preventive health manager. “Our ability to measure and track metrics helps us keep our eye on our target as far as participation, satisfaction, meaningfulness and effectiveness. It helps us know which programs are successful and desired, and determine where we need to deploy our resources to get the best results.”

“We’re able to tell a health story in more meaningful ways to benefit the employer and the employees,” Callie said. “It’s about creating year after year of great programs based on what employees need and want.”

A result of such metrics analysis, the Healthy Me in 2019 program strives to provide simpler, more focused and collaborative health education.

As of July, the program netted a 60.4% increase in employee participation as compared to 2018.

“Most places don’t collaborate at the level Sandia does,” Callie said. “SERP (Sandia Employee Recreation Program) blew their minds,” she said. The program provides employees discounts to local gyms and activities, as well as opportunities to join sports teams. Employee Health Services also regularly collaborates with Safety, Community Involvement, Food Services, Virgin Pulse and MoGro, a local growers’ market that provides fresh produce boxes for purchase.

“Our ability to collaborate with folks across the Labs allows employees to be more productive at work, be present and feel better,” Kim said.

Division workplace engagement teams are one example of an effective collaboration, she said. Preventive Health works with division teams to provide customized health activities and education opportunities, including incentives for people to participate. “WEC (workplace engagement committee) teams know their populations more intimately than we do, so they know the division’s needs.”

Kim added that leadership support makes a huge difference in employee participation. “Leaders who model participation in wellness events let employees know it is important and drives engagement.”

“When that happens,” Callie said, “we see people feel empowered to take action, and we see a higher participation in tech park walks, screening events, organizational Health Action Plans and classroom events.”

The multidisciplinary Preventive Health team is a collaborative group in itself, Kim said. “If we see a patient for fitness and they also need guidance around diet, we have all those subject matter experts in one center to refer people to.” Kim also credits the team’s effectiveness on their home-grown tools — such as Health Action Plans — that provide everything an employee needs to make a health change in one package.

The team’s internal collaboration is one that employees, including Debra Chavez, seem to appreciate. “I like that it’s there when I need it,” said Debra, who has used preventive health

services for most of her 31 years at Sandia. “A lot of people may not know that one-on-one coaching is available for fitness, sleep, stress, nutrition — they offer a variety of different ones. It’s a great benefit to have.”

“Giving employees an opportunity to optimize their health helps the employer not just because employees have less sick time, but they are happier overall and feel better about themselves and come to work feeling better,” Debra said.

Zuzana Patterson joined a Health Action Plan within two months of starting at Sandia more than five years ago. “It worked great! I was able to lose the pounds and hit my target,” she said, adding that Preventive Health staff were very responsive and available. Since then, she’s taken advantage of many health programs offered, and even fills in for the Tai Chi instructor sometimes.

“If we aren’t healthy or happy with ourselves, we’re not performing well,” Zuzana said. “Having that support gets us one step closer to getting there. It’s up to each person to do it, but having it available is a big plus.”

Callie credits her team for much of their success. “(The health educators) are passionate about sharing the information they believe in with employees. It’s not just a job,” she said.

“Callie getting invited to speak (at the forum) was really a tribute to her leadership and positive engagement and the culture she’s trying to build in her team,” Kim said. “It was really an honor for her and for Sandia Labs.”

Callie’s passion for health education was evident in the feedback she received from her HEROForum19 talk. Her presentation was one of the highest rated at the event and she has already been invited to present again at next year’s forum.

At Sandia, the health education team is currently planning 2020 programs, which will include an updated Healthy Me in 2020, a new Food Connections Health Action Plan and more.

“We’re always looking for ways to improve, innovative ways to engage employees and give them a better experience with corporate health, better results and better outcomes,” Callie said. “We’re never done.”



INSPIRING FITNESS — Sandia health educator and program coordinator Callie Lovato was invited to present at Virgin Pulse’s HEROForum19 in early September.

Photo by Randy Montoya



LEADING THE WAY — From left, Sandia health educator and program coordinator Callie Lovato, exercise physiologist Valerie Vieira, certified diabetes expert Elizabeth Quintana, exercise physiologist Heather Morgan and exercise physiologist Jenny Thomas took a break from leading activities during the 2019 Employee Health and Wellness Day event at Hardin Field in May.

Photo courtesy of Callie Lovato